

PROMOTING NEW LITERACIES IN SCHOOLS: A proposition to integrate digital literacy in pre-service teacher education

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Abstract

This paper renders a preposition to integrate Digital Literacy into Pre-service teacher education programs in universities and various teacher trainings. The current emergence of high dependence toward digital technology demands teacher education programs to make contribution in order to educate and prepare pre-service teachers to overcome issues related to negative impacts of digital technology. 21st century skills are amongst the core requirement for advanced human resources living in this era. Teacher education curriculum must be able to accommodate sufficient knowledge and resources to enable students becoming digital literate society. As what depicted today among our society, very little attention given toward the way using internet technology securely and politely. Beginner adopters of technology are now spoon fed with very user friendly gadgets and apps that often neglect to learn about effects and impacts the technology caused. In addition, although it still can be argued, often most of the marvels do not really foster productivity for these groups of technology users. Therefore, proposition to raise awareness among pre-service teacher in is emphatically needed.

Keywords: *Digital shocks; Infocipation; New Literacy; Digital Literacy; Web 2.0; pre-service education; 21st century skills*

Abstrak

Tulisan ini memuat usulan untuk mengintegrasikan Digital Literacy (Melek digital) ke dalam program Pendidikan guru di tingkat Universitas dan di berbagai program pelatihan guru. Saat ini banyak bermunculan permasalahan-permasalahan karena tingginya ketergantungan terhadap teknologi digital yang membutuhkan program Pendidikan guru untuk turut serta berkontribusi. Kontribusi yang diharapkan adalah adanya muatan pembelajaran yang memfokuskan pada pengayaan dan peningkatan kesadaran mahasiswa (dan siswa/pelajar) agar dapat menjadi masyarakat yang melek digital (digital literate). Banyak hal yang terjadi dewasa ini dikarenakan kurangnya perhatian kita terhadap pendidikan teknologi, dimana cenderung kita hanya memprioritaskan kepada aspek kemampuan mengoperasikan teknologi namun sangat kurang membahas dan mengedepankan aspek kepantasan dalam mengoperasikannya.

Ini menyebabkan minimnya dampak perkembangan teknologi yang positif di kalangan pelajar, dimana cenderung membuat mereka tidak produktif. Dasar-dasar inilah maka usulan ini dirasa penting dan urgen untuk meningkatkan kemahiran mengoperasikan teknologi serta membuat calon guru mampu mengevaluasi kepantasan dari dampak teknologi tersebut terhadap masa depan calon anak didik mereka nantinya..

Kata Kunci: *Digital shocks; Infocipation; New Literacy; Melek digital; Web 2.0; Pendidikan guru; keterampilan abad ke-21*

INTRODUCTION

My 5-year-old daughter has acquired an ability to recognize various icons and their functions displayed on a tablet-PC device months before she was able to recognize letters of the alphabets. I assume many parents today do not really pay attention about significant cognitive development of early literacy of a toddler born and raised in the digital age. Portable computing devices such as smartphones and tablet-PC amongst many other tech-*gadgets* available today have contributed significant effect on literacy development on people, especially young learners. Being careful parent, my wife and I have made several precautions toward the effect of these gadgets to the way our children develop. We are very much aware of how the life of our children in the future will be controlled by these marvels, and how values and attitudes can be threatened by lack of proper education and control toward the use and integration of digital technologies in their life.

The force of the digital technology is far too massive. Although I have tried to limit access at home, my children are exposed to the technology elsewhere outside of home. My other adult relatives have given full access to such gadget to their children as a toy—surprisingly with GSM internet plan installed. When they gather along, these children will pick a corner and play with their devices—who knows what are shown in the display, and no adults accompanying them. Most of the adults will only smile at these kids and often uttering ‘*how smart are children nowadays with tech.*’ Yes, there are lots of positive tools and programs (applications/apps) that these children can access, but without any supervision by *wiser* adults, who knows what internet content that they are trying to read or view. Allowing the children to access internet without supervision is an ‘investment of future demise.’ Parents and adults lacks of concern on what technology could impact children will just make children to become more uncontrollable to fulfill their curiosity. Therefore, to protect this next generation, parents, and very

importantly, educators and educational institution must be held responsible to review and provide solution as well as to help raising awareness of impacts of digital technology for learners.

Digital natives are what we call these children of today¹. Being digital native is because they were born and brought up in the digital age, where everything that surrounds the society is digitized. As for the context of education, these children are what Mark Prensky described as the “native speakers” of the digital language of computers, video games and the internet (p. 1). Prensky added that students today have changed radically as they are no longer the people of the educational system that we designed to teach.

The education systems that we have spent decades innovating need to be reassessed in order to be on a par with today’s societal issues. The concern was due to teacher educations being fairly left unchanged in the traditional way we understand literacy that focuses merely on the ability to read and write words². Today, literacy is considered as tools for students to participate more fully in the technological society of the 21st century. Additionally, Kress³ and Kist,⁴ to name a few, suggested a term “new literacies” as sophisticated ways to read and write multimodal texts along with words, images and sounds that allows opportunities for the students to be innovative in making meaning, exploring their world and voicing their lives. The emergence of these new literacies needs to be accounted in the education system that we develop for learners of this generations—the digital natives. With regard to that, educators are needed to be in the foremost line to make such changes.

This paper will render some of the proposition for pre-service teacher education at Universities to allow some rooms for research and development to promote the new literacies in the course programs and also to raise awareness of goods and harms of the digital technology by emphasizing digital literacy in technology-related courses. In addition, at the same time this paper will stimulate

¹ Prensky, Marc. "Digital Natives, Digital Immigrants Part 1." *On the horizon* 9 5 (2001): 1-6.

² Tompkins, Gail E., and Hazel M. Hussong Fund. *Literacy for the 21st Century: A Balanced Approach*. 4th ed. Upper Saddle River, NJ: Pearson Education/Merrill/Prentice Hall, 2006., see also Gee, James Paul. "The Old and the New in the New Digital Literacies." *The Educational Forum* 76 4 (2012): 418-20. And Street, Brian V. *Social Literacies: Critical Approaches to Literacy in Development, Ethnography and Education*. Real Language Series. London ; New York: Longman, 1995.

³ Kress, Gunther R. *Literacy in the New Media Age*. Literacies. London ; New York: Routledge, 2003.

⁴ Kist, William. *New Literacies in Action: Teaching and Learning in Multiple Media*. Language and Literacy Series. New York: Teachers College Press, 2005.

researches to look on the impact of digital technology on the society from the education point of view. The output is that it will foster the development of teacher training curriculum that emphasizes on multiple aspects, to name a few, current demand of learning and working skills and societal impacts of the growing digital technologies.

DISCUSSION

Teachers play a decisive role in using technology in their classroom⁵ and their digital competence⁶ is regarded as significant and influential in deciding which digital contents and tools best to use and how to use them effectively without jeopardizing the effect of it. However, what I observed was that very little attention given to this matter and many of teachers are unaware of the impacts of technology in the society and often neglects discussing it. As technology users, teachers often securing their preconceived ideas that how these students interact with technologies are of nothing to be worried about. Similar to parents, teachers share the same attitude about technologies being used by young learners. Very often we heard that the teachers tend to avoid talking about technologies due to their limitation of knowledge or lack of confidence. This will create a huge gap between teachers—the *old schoolers*⁷ and learners—the digital natives⁸, in which will become more severe in the future if nothing is being done. The following discussion renders some issues and concerns for further study to incorporate digital technology discussion in education policy and strategy development.

Information Overflow and Digital shocks

The current world we are living has reached to a stage where information flow has become dangerously rapid and massive. The development of the internet has made people to become less wise, if not impossible, to take decisions and keeping oneself informed on a particular matter and subject due to the ever-ceasing amount

⁵ Olofsson, Anders D, et al. "Uptake and Use of Digital Technologies in Primary and Secondary Schools—a Thematic Review of Research." *Nordic Journal of Digital Literacy* 6 04 (2011): 207-25.

⁶ Instefjord, Elen, and Elaine Munthe. "Preparing Pre-Service Teachers to Integrate Technology: An Analysis of the Emphasis on Digital Competence in Teacher Education Curricula." *European Journal of Teacher Education* 39 1 (2016): 77-93.

⁷ The term *old schoolers* (slang: *Old-skool-ers*) is also known with the term digital immigrants

⁸ The term digital natives are also known with the term *millenials*

of data and content accessible. The effect of this is called *infoxication*⁹ with other former known terms; *information overload*¹⁰ and *infobesity* popularized by Alvin Toffler¹¹ in 1970. Back 25 years ago, these wonderful futurists have predicted that the growth of technology will be far too immense and will severely change the way we act and make decisions. Toffler remarks “We must search out totally new ways to anchor ourselves, for all the old roots — religion, nation, community, family, or profession — are now shaking under the hurricane impact of the accelerative thrust” is inevitably must be of our attention to keep things in order.

The information technology has penetrated the world in an amazing growth rate. The number of internet users has increased tenfold from 1999 to 2013, which the first billion of internet users reached in 2005, followed by the second billion and third billion respectively in 2010 and 2014.

Around 40% of the world population has an internet connection today ([view all on a page](#)). In 1995, it was less than 1%. The number of internet users has increased tenfold from 1999 to 2013. The first billion was reached in 2005. The second billion in 2010. The third billion in 2014. The chart and table below show the number of global internet users per year since 1993:

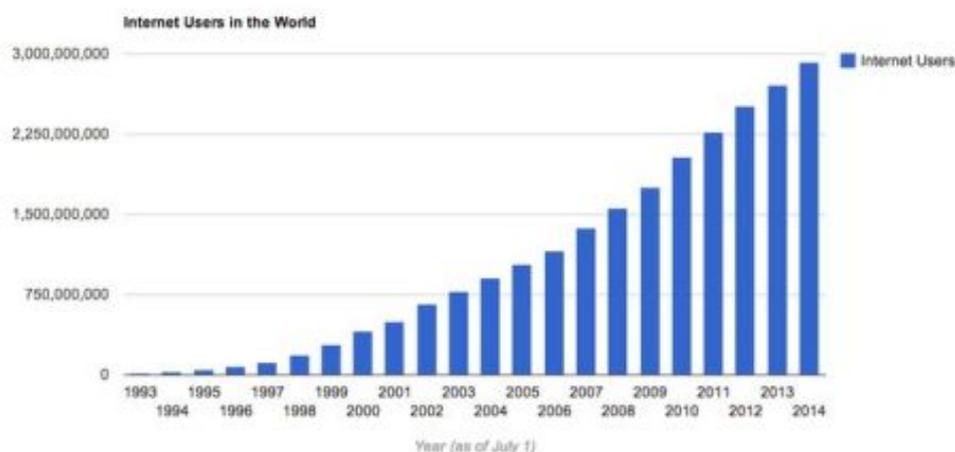


Figure 1: from Huffington post internet users per years¹²

This phenomena is a threshold of a new age that allows people to have unlimited access to information. However, we may see this as a positive change if

⁹ Chamorro-Premuzic, Tomas. "How the Web Distorts Reality and Impairs Our Judgement Skills." *The Guardian*.14 May 2014 (2014). 17 November 2016

¹⁰ Gross, Bertram Myron. *The Managing of Organizations; the Administrative Struggle*. 2 vols. New York: Free Press of Glencoe, 1964.

¹¹ Toffler, Alvin. *Future Shock* New York.: Random House, 1970.

¹² Diamandis, Peter. "The 'Rising Billion' New Consumers Will Arrive by 2020." *huffingtonpost.com*.6 April 2015 (2015).

we compare it to the way we run things in the past where most of the tasks were done manually and processes we can do in a minute were formerly done in days. Nevertheless, we should also see it critically on how people who are new to the technology-dominated environment reacted and change their behaviors as everything now has become digitalized (Digital Shocks).

The most sophisticated digital system that really shapes the way people seek for information is fostered by the evolving internet technology. The former internet version— the so-called web 1.0¹³ (1990-2000) only provides static information, where most of the content of the internet that can be accessible from the world-wide-web (www) is composed and made available exclusively by institutions. The information is primarily put on a webpage for static display. Web 2.0 was being developed from 2000 to 2010, which is known as the semantic web. The foremost notable feature of the web 2.0 is that the users of the internet have become part of the content development of the internet. Users, both institution and individuals were the composers of the information shared on the internet. The current version of the internet technology is the web 3.0 as what most people call it as the intelligent web. This version of internet technology is also known as the web-OS or the web Operating system where the internet itself is capable to operate by itself with very limited control required by the users. Websites of this generation have become applications that execute processes similar to the desktop applications that we normally use on our PC. Also, in this generation of web technology, data is the main target. The web is like data hog that records everything possible whilst the collected data is being processed for marketing strategy or even for some political purposes.

The current internet technology depends on each individual user to support the data. This web technology resembles a living entity being constantly hungry to be spoon fed (of data) to grow and to become smarter. In line with this, Social media is one of the technologies created that provides the greatest source of data for this “living entity” to learn. Social media is a very popular internet feature that allows individual user to self-publish oneself to the world (internet) by putting self-made contents such as texts, images, videos for other internet users to view. In addition, this technology also allows one (a user) to be linked and connected

¹³ Radar Network & Nova Spivack. *Visual Illustration of Web 1.0 to 4.0*. 2007. Radar Networks.

through the affiliation and user-linking features. This feature has made significant change in the way people share ideas and various contents in the internet. Such massive amounts of data (information) is being exposed and exchanged once a person is affiliated to certain social media networks. User's affiliation with other users has made single information to become rapidly shared and distributed to uncountable "*friends of friends of friends...*" display screens. The *parameter* of trusted information is merely "*what came from a friend's account.*" What happen if the information shared is, for example, misleading, or false, or dangerous?

However, it has become my interest to know how many educators question about how today's learners search for information they need. Do learners today still rely on teachers to acquire information? Or, do they tend to rely and trust information from the internet rather than teachers? I assume, based on my experiences teaching at the university, some of my students were often having difficulty taking notes from discussion or presentations, and surprisingly also rarely ask questions. They do take notes, however, only some keywords that they believed they heard from the class. Most of my students admit that they do not really put interest to the explanation in the class because they are very confident that they can find the subject/topic discussed later when internet access is available. This worries me because the internet are full with mix of trusted and untrusted contents, good and bad, true and false, important and junks. Will my students find the right ones once they use internet search?

The emergence of 21st century skill

Recently, there has been great interest put into the study of technology integration in education. The current emergence of a global movement called the *21st century skills*¹⁴ is focusing on technology integration in education. Conversely, in spite of the exponential growth of Information Communication Technology (ICT) in Indonesia, Indonesian education is still lacking in the consolidation of technology in education setting. To give a comparison, Malaysia has started the initiative of the vision 2020 to support ICT related programmes and projects in the

¹⁴ Rotherham, Andrew J, and Daniel T Willingham. "21st Century Skills: The Challenges Ahead." *Educational Leadership* 67 1 (2009): 16-21.

9th Malaysian Plan 2006-2010¹⁵. Subsequently, another recent national project called **ibestarnet project** was launched in December 2011. This national wide project called **ibestarnet** is a cloud-based integrated Platform as a Service (PaaS)¹⁶ to connect 10,000 schools across the nation on 4G network infrastructures (IaaS). However, although the project was being reassessed due to infrastructure development issues, the country initiatives signify that the country is well-aware on the future of the education challenges especially to provide technology integrated education available to all Malaysian.

As for Indonesia, there is very little attention devoted to upgrade education in Indonesia in that specific area. Indonesia, as a developing country, has been very aggressively upgrading the internet infrastructures across the archipelago due to high demand of growing number of IT users in Indonesia. An US-based research firm called International Data Corporation (IDC) reported that Indonesia's Information and Communication Technology spending in 2017 was predicted as high as IDR339 trillion, which IT services alone were only IDR18 trillion. The highest spending of ICT was from the consumer who bought ICT technologies such as smartphones, PCs, tablets and alike¹⁷. This user-driven spending is estimated to increase very significantly as the year reaches 2020, which according to the same research will increase 16% to IDR394 trillion.

Another research report by We are Social: Digital 2016, Internet penetration in Indonesia as per end of 2015 is 34% of the total population, which is estimated up to 88.1 million people have access to the internet¹⁸. **Statista**, a population data by World Bank, estimates internet penetration in Indonesia to reach 53% by 2020 (statista.com). To add the astonishment, Indonesia placed respectively 3rd and 4th highest in the world for *Twitter* and *Facebook* users, which time spent for internet via mobile device goes up to 3.5 hours on average per day (while United states remain only 1.9 hours per day) as reported by **We are Social 2016**. The constant increasing number of user is primarily because the mobile network and mobile device have become very affordable.

¹⁵ Farhana, Siti Noor. "Teachers' and Learners' Perceptions Towards the Use of Frog Vle in the Teaching and Learning of Reading Comprehension." International Islamic University Malaysia, 2015.

¹⁶ "IaaS, PaaS, SaaS (Explained and Compared)". 2016.

¹⁷ Baziad, Masyitha. "Indonesia's Ict Spending to Hit Us\$29.5bil in 2020: Idc". 2017. (Jan 20, 2017); digitalnewsasia.com. May 23, 2017..

¹⁸ Das, Kaushik, et al. *Unlocking Indonesia's Digital Opportunity*. McKinsey Indonesia Office, 2016.

Despite the positive report as mentioned earlier, ICT spend lags in education sector with less than 5% of GDP in 2015 compared to Malaysia that sums up to more than 11%. This is due to very limited users in education sector that utilizes ICT. Nonetheless, I am certain that the Indonesian government is working on stimulating more ICT utilization in education sector, as what I have seen that the integration of online management tools for educational administration has now become common. However, ICT utilization in academic and pedagogical context such as in classroom or teaching-learning related use is scarce.

Although what rendered by the statistics that Indonesian users of internet technology is vastly growing, it does not mean that the learners' academic productive skills are also significantly developing. One of the factors is that learners' productive skills were being bogged down due to the spoiling effect of the "user friendliness" of digital technology, especially the mobile technology. As an example, my recent study about my students' computer skills reveals some interesting phenomena that most of the students starting to disregard a notebook-PC as a-must-have productive tool for a university student. A number of my students use notebook PC primarily for internet browsing, viewing video and online gaming. In the same group of students, I also found that some of their basic computer office productivity skills are relatively low. On the contrary, these students use smartphones with 4G internet plan and packed with variety of applications (apps). They seem fluent in operating various apps in their smartphones, such as social networking apps, utilities, and camera and video apps. Curious enough, I started to assert that these students tend to be more productive by using smartphones rather than notebook PCs. However, the negative impact of overuse of mobile devices has made students' use of language and language spelling/grammar accuracy at risk.

English as the default language of the internet

English language learning remains stagnant due to lack of stimulation of communication in the target language prescribed by English teachers. Indonesian English use context is regarded as English as *Foreign Language*, which resides in the *expanding circle*¹⁹. People in Indonesia normally learn English for a specific purpose

¹⁹ Kachru, Braj B. *The Other Tongue: English across Cultures*. Oxford: Pergamon, 1983.

rather than administrative or social. This was due to English is not integrated in the administrative, education, nor social context. While that is the case, as internet has become very common to Indonesian learners, adding that English is the internet's default language, Indonesian learners are encountering with massive inputs and meaning negotiation in English as they are interacting and participating in the virtual world. Hence, English is somehow become another "important" language next to the mother tongue. For frequent internet users, English is now becoming their "Second Language" as they negotiate and communicate for diverse purposes ranging from administrative to social.

With regard to the English contextual status for ever-growing internet users in Indonesia, which is a reminiscent of real English usage as in other outer circle or inner circle countries, English language teachers in Indonesia must change their approach to language education if they wish to take full advantage of the benefits that new technologies can potentially offer in order to maximize the engagement opportunity with English inputs. In addition, the utilization of the digital technology in English language teaching must not only allow students to learn forms but also to enhance cultural competence in the cultural continuum²⁰.

Digital Citizenship and Digital Literacy

When people are gathering on the internet, they are establishing a community of sort that we call them the netizen. Netizen is a term that refers to the internet citizen, the society that exchanges information and communicate with one another in the internet network. Digital citizenship established when there are communication taking place in the virtual world, which can be traced back to when internet was born. However, the significant growth of the digital citizenship was triggered by the birth of social media. Social media refers to types of medium where internet users use to socialize and connected for certain purposes.

The first social media can be traced back in 1970 when first e-mail travels between 2 computers. Later in 1980, *American On-Line (AOL)* was introduced in 1980 followed by blogging era with *live journal* and *blogger*. By 2000, first popular social media was launched, a platform called *Friendster*. The following years are dominated with web 2.0 systems where collaborative contribution has become the

²⁰ Blake, Robert J. *Brave New Digital Classroom : Technology and Foreign Language Learning* Washington, D.C.: Georgetown University Press, 2008.

attraction for users to publish themselves freely. *LinkedIn* and *myspace* dominated the internet during that time, but right after Zuckerberg's *Facebook* was launched; it has eventually takes over the social network kingdom until now. Some other platforms are also born and attracted significant number of users that provides similar ideas but with different content genre, such as *youtube*, *twitter*, *tumblr*, *spotify*, *instagram*, *pinterest*, and *vine*, to name a few.

The options of social media platforms are vast. The internet has now become the sanctuary for the society to inhabit. This phenomenon is interesting, as people of today are living in two different worlds; **the real world** and **the virtual world**. Our students are the native generation of this parallel world scheme; they are the digital natives who I considered are very fragile and exposed very limited to the real world common norms. Often we see that students tend to be more active in the virtual world rather in the normal real world. They are less interested to what happen in the real world but has huge interest to what is happening virtually. In addition, they are also less interested to the real social network, tend to avoid interacting with people in the neighborhood or socialize in a family gathering, instead, often found giggling alone in the crowd holding a handheld device.

With the current availability and affordability of device to enable them to participate in these two worlds, it is certain that there can be gaps between the people who already lived before this era. Such gap is that there is strong possibility that older generations tend to be reluctant to intervene or control the new generation's behavior due to lack of knowledge as well as confidence. Much we hear from parents in our society is about controlling children's time to interact with this media, by allowing their children to only use their connected tables or smartphones for certain duration or at particular time. Lack we know that within the short time a child interacting with the connected internet found a lot more than what they are not supposed to find. Parents' lack digital awareness tends to be more permissive and lenient on the use of internet technology at homes, which very often limit them of understanding the essence of real world. As an example, the social media as *facebook* is so crowded with *netizens* with around 15% of world population today are using *facebook* to interact with one another in a month.

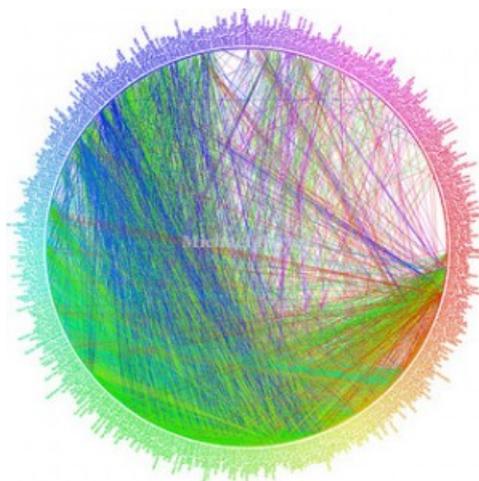


Figure 2: Facebook friends was from: FaceBook Friends Network Visualization. CC Image Source: Michael Porter (Libraryman). Available: <http://www.flickr.com/photos/libraryman/3703100645>

Digital Literacy

Digital literacy often used to refer to phenomena that falls under the concept of new literacies.²¹ Both overlap in some points especially because both arise from the new technologies and new social practices for literacy emerge.²² However, the emphasis of digital literacy is on the ability to select appropriate and operate digital technologies and the ability to select, understand and use information ability to solve problems and perform tasks effectively in a digital environment. Digital literacy is defined as the ability to use information and communication technologies to find, evaluate, create, and communicate information, requiring both cognitive and technical skills.²³

Digital technology savviness such as only having the ability to operate and fix any digital technology related matter is not sufficient. Overfondness on digital technology will only make a person to become avoiding real social interaction (asocial). Such behavior will develop social apathetic and tend to remove self from

²¹ Coiro, J., Knobel, M., Lankshear, C., & Leu, D. J. (2008). Central issues in new literacies and new literacies research. In M. K. J. Coiro, C. Lankshear, & D. J. Leu (Ed.), *Handbook of new literacies research* (pp. 1-22). New York: Lawrence Erlbaum Associates.

²² Leu, D. J. (2000). Literacy and technology: Deictic consequences for literacy education in an information age. In P. M. M. L. Kamil, P. D. Pearson, and R. Barr (Ed.), *Handbook of Reading Research, Volume III* (pp. 743-770). Mahwah, NJ: Erlbaum.

²³ Visser, M. (2012). Digital Literacy Definition. Retrieved from AlaConnect website: <http://connect.ala.org/node/181197>

being a part of a community or original identity. As an example, a number of online gaming enthusiast students in one of my class suffer loss of interest just being with other students of the same study group who do not share the same interest in online gaming that results low collaboration among the group and leads to low achievement.

The emergence of collaborative internet technology has made more and more contents available for every internet user to access. This also shapes internet users attitude to become very dependent on internet. As what has been discussed in the previous part of this paper about the amount of information flying across the internet is massive, how can we ensure that our learners select which *version* of information that they are supposed to retrieve? How do we know whether they access trusted contents or untrusted ones? Very importantly, how do we protect them from being indoctrinate or influenced by subliminal advertising or aggressive media propaganda that has been crafted to steer internet users' opinions on some specific political issues? And how do we keep them safe in the virtual world? These questions are what should entail once we realize that our students are actually exposed to a real *virtual* world.

It is important that we introduce digital technologies to our students so that they could advance and simplify processes when they perform tasks, but it is also far more important that educators take responsibilities to teach and educate them how to evaluate these digital technologies by introducing them that digital technologies are very attractive yet full of hazards and risks. Therefore, the concept of digital literacy must be introduced and integrated in the pre-service teacher education curriculum in order to have digital literate graduates who will disseminate the concern and help raise awareness toward potentials and risks of the today's ever-growing digital technology.

CONCLUSION

The need of educating pre-service teachers on technology impacts is not only significant but also urgent. High penetration of internet and significant improvement in Information Communication and Technology has not yet contributed to the productivity in teaching-learning sufficiently. Added to that, there is no or maybe very limited baseline data that explains the level of teachers' digital literacy and teachers' internet technology operating competencies.

The lack of concern from both the government and the society is considered to manifest serious problems in the society. Prior to the development of policies and curriculum that integrates the concern on digital technology, rigorous studies are required to describe those issues from the educators and societies point of view. Social research on educational technology is very much needed in order to describe the actual phenomena and issue in order to generate hypothesis of what is actually happening instead of testing hypothesis²⁴ of how education technology might help and foster certain pedagogical achievements. In addition, as for the context of Indonesian society and education system, critical ethnographic data is fundamental to describe detail patterns of attitudes and beliefs underlying the lack of concern in this matter. Therefore, the expected outcome of the studies will be developed into learning materials and instruction guidance for lecturers and the pre-service teachers themselves to plan not only better instruction in particular but also raise better awareness on the technological impacts to our society as well as sustaining high quality human resources for the future challenges and global goals ahead.

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²⁴ Cohen, Louis, Lawrence Manion, and Keith Morrison. *Research Methods in Education*. 6th ed. London ; New York: Routledge, 2007.

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